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The Role of Syringe Filters in Harm Reduction Among Injection Drug Users

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ABSTRACT

Objectives. Three filters were tested for in situ efficacy in reducing bacterial contamination associated with injection drug use.

Methods. In a self-matched control design with blinded laboratory testing, injection drug users were asked to use 3 filters in random succession when loading their syringes with drug solute.

Results. The 0.22-μm filter proved significantly better than both the cigarette filter (relative risk [RR] = 18.0) and the 20-μm filter (RR = 4.5) in rendering syringes bacteria-free.

Conclusions. The 15- to 20-μm syringe filter currently provided injection drug users in Switzerland does not significantly reduce contamination associated with common bacterial infections among users. Filters with pore width 1/100th as large are recommended. (*Am J Public Health.* 1999; 89:1252–1254)

It has been well established that injection of illicit drugs is associated with excess morbidity and mortality, owing not only to drug reactions (e.g., overdose) but also to hygienic conditions and sharing behaviors surrounding syringes and needles. That injection drug use carries tremendous risk for the transmission of infectious agents has been evidenced most dramatically by the devastating impact of HIV among injection drug users (IDUs) worldwide.

In many areas a variety of harm reduction policies have been adopted, although they are controversial, as a humane, appropriate, and effective way to curb the negative health consequences associated with illicit drug use. Switzerland has been home to several unique harm reduction policies related to drug use—for example, Needle Park, "shooting rooms," public syringe vending machines, heroin prescription programs, and needle exchange in prisons. In September 1997, authorities in several Swiss cantons officially added sterile 15-μm syringe filters to the materials normally made available to IDUs at low-threshold sites (i.e., sites with no entry criteria and no requirement for registration or continued participation). The introduction of similar filters in cities in the Netherlands and Germany is currently being discussed.

In-depth studies on drug injection behavior have pointed out the possible risk of infection at practically all steps of the drug injection procedure.[1] Even when new needles and syringes are used, bacterial and viral infections can be spread by contaminated spoons, water, solvent, filters, or injection sites. In Switzerland, practically all IDUs use cigarette butts to filter the dissolved drug solution into the syringe. At most, cigarette filters prevent large particles from entering the syringe; however, they are neither sterile nor effective against small

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organisms such as bacteria. The pore width of the syringe filter (15–20 μm) is theoretically insufficient to reduce bacterial contamination, but we wanted to compare its efficacy against a syringe filter with a finer pore width in situ.

Methods

In August and September 1997, 24 IDUs were recruited at a low-threshold site offering needle exchange and medically supervised shooting rooms in Zurich, Switzerland. Three filters were examined: filter A (Millex-GV-13 with 14.5-mm shell diameter and 0.22-μm pore width), filter B (Sherwood 1062440 with 8-mm shell diameter and 20-μm pore width), and filter C (the filter normally found in a filtered cigarette). The 2 syringe filters attach directly to the syringe, and the drug solute can be drawn either directly through the opening of the filter or via a needle attached to the filter.

A schedule for all potential participants was set in advance, with randomly generated numbers used to determine the order in which the 3 filters would be used by each participant. The actual participants were then asked to use each of the 3 filters, together with clean needles and syringes, on 3 separate occasions, according to the randomly prescribed order. The participant prepared the drug solute, drew it into the syringe through the filter, disposed of the filter, placed a needle on the syringe—all under supervision—and then went alone into a separate room to inject the substance. Afterward, the participant returned the used syringe to the attending physician, who put a new needle on the syringe and washed the contents into an aerobic FAN culture bottle (Organon Teknika Corp, Turnhout, Belgium). The physician then labeled the bottle with a simple numerical code that did not indicate which filter had been used or who the participant was. In the laboratory, the samples were analyzed in a blinded manner. Bacterial growth was measured by the automated BacT/Alert microbial detection system (Organon Teknika Corp). If the growth index was positive, aerobic and anaerobic subcultures were performed on sheep's blood agar and the bacteria were differentiated according to routine procedures.

Initially, SPSS software (SPSS Inc, Chicago, Ill) was used to analyze the data with the McNemar test for paired data. Because zeros occurred in the paired 2×2 tables, odds ratios for paired data could not be calculated for this analysis. Therefore, standard χ^2 tests were used, and relative risks (RRs) with 95% confidence intervals (CIs) are presented for the concordant results.

TABLE 1—Results of a Self-Matched Control Study on the Power of Syringe Filters to Render Syringes Bacteria-Free After Injection of Illicit Drugs: Zurich, Switzerland, August–September 1997

	Uncontaminated Syringes, No. (%)	RR (95% CI)	*P*
Filter C (cigarette filter)	1/24 (4.2)	1.0	
Filter B (20-μm pore width)	4/24 (16.7)	4.0 (0.48, 33.2)	.17[a]
Filter A (0.22-μm pore width)	18/24 (75.0)	18.0 (2.6, 124.3)	<.00001

Note. RR = relative risk; CI = confidence interval.
[a]Fisher exact test, 1-tailed.

Results

Briefly, the study sample was primarily (92%) male, with a mean age of 32.7 years (SD = 5.8) and mean duration of injection drug use of 7.7 years (SD = 5.3). Eighty percent of the participants were enrolled in a drug substitution program, and more than half injected "cocktail," a combination of heroin and cocaine. Self-reported HIV prevalence was 21%, and practically all respondents reported currently or previously being infected with hepatitis. Except for an overrepresentation of men (the male:female ratio is normally 3:1), the characteristics of this sample are representative of the clients who frequent the site.

All but one of the syringes used with the cigarette filter (filter C) exhibited evidence of bacterial contamination (Table 1). Our data suggest that filter B was slightly more successful at filtering out bacteria, but any improvement over filter C is modest at best (Fisher $P = .17$; McNemar $P = .63$). Filter A proved to be much more effective than either filter C (Table 1) or filter B (RR = 4.5, 95% CI = 1.8, 11.3; χ^2 $P = .0005$; McNemar $P = .0001$) in rendering syringes bacteria-free after drug injection.

As seen in microbiological studies of street heroin and injection paraphernalia,[2,3] *Bacillus* species and coagulase-negative *Staphylococci* were the most common bacterial agents found in the syringes. The distribution of microbiological organisms does differ among IDU populations,[4] however, with high prevalences of *Staphylococcus aureus, Streptococcus* species, and anaerobes present in some groups of IDUs.[5,6] The latter 2—alone or in polymicrobial combination—are responsible for the formation of abscesses, the most common infectious complication among IDUs.[6]

Discussion

The introduction of syringe filters is a welcome development in harm reduction. This small trial shows that the 15- to 20-μm filter currently being distributed to IDUs in Switzerland and being considered elsewhere in Europe is inadequate to achieve a significant reduction in bacterial contamination, which is a reasonable and attainable goal with current filter technology. The ideal pore size should be 1/100th as large. The 0.22-μm filter tested here proved significantly more effective than the 15- to 20-μm filter in limiting bacterial contamination, it was feasible in actual practice (i.e., there were no problems with greater density), and it was preferred by many IDUs once its potential health benefits were made known.

Our experience has shown that 2 key factors should accompany the introduction of syringe filters—information on the risks of contamination and training in proper use of the filters. Many IDUs are eager to abandon cigarette filters, not only because of the health benefits of more efficient filters but also because cigarette filters absorb a great deal of the drug solute. Thus cigarette filters are often kept and given as gifts or used in combination with filters from other users for an additional hit. This practice has implications for viral infections as well, since it is, in fact, sharing. The 0.22-μm filter has a void volume of ≤ 50 μL (equivalent to one drop), and the filter membranes are not easily extractable from their plastic casing, so filter sharing is unnecessary and impractical. Thus, there are several public health benefits associated with providing effective filters as part of an overall harm reduction policy. □

Contributors

C. Caflisch conceived the study, recruited the patients, collected the samples, performed preliminary data analyses, and drafted an overview of the study in German. J. Wang performed definitive data analyses and wrote the manuscript for publication in English. C. Caflisch and J. Wang collaborated closely on the study design, with input from R. Zbinden for the laboratory section. R. Zbinden analyzed the samples in the microbiology laboratory. All 3 authors contributed to the writing of this paper and reviewed the manuscript at all stages of revision.

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Jamaica's Measles Elimination Experience

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ABSTRACT

Objectives. This article describes the effort to eliminate measles from Jamaica and its impact on measles incidence.

Methods. In addition to routine measles vaccination, the Jamaican Ministry of Health implemented a strategy of a 1-time-only catch-up vaccination campaign, conducted in 1991, and periodic follow-up campaigns, the first of which occurred in 1995.

Results. Since 1991, despite careful surveillance, no serologically confirmed indigenous cases of measles have occurred in Jamaica.

Conclusions. Measles virus circulation has been interrupted in Jamaica. The Jamaican experience provides further evidence that global measles eradication is achievable. (*Am J Public Health.* 1999;89:1254–1255)

Measles remains a major public health problem, especially in developing countries. More than 1 million children worldwide are estimated to die annually from measles.[1] Historically, measles has had a significant impact in Latin America.[2] Although accurate pre-1975 data are difficult to obtain, it appears that in the past measles led to significant morbidity and mortality in Jamaica.[3,4]

Measles elimination from the Americas by the year 2000 is a stated goal of the Pan American Health Organization.[5] The English-speaking Caribbean is the first subregion in the world to interrupt the indigenous transmission of measles.[6] Jamaica's experience can be useful for measles elimination efforts in other countries.

The eradication and regional elimination of certain vaccine-preventable diseases, such as smallpox and polio, have been demonstrated. The Pan American Health Organization has taken the lead in eliminating measles from the Western Hemisphere. Jamaica is the third largest island in the Caribbean and has a population of approximately 2.5 million. Jamaica has many international visitors, thus increasing the risk of measles importation.

In this article we describe efforts to eliminate measles from Jamaica and the effect of these efforts on measles incidence.

Methods

Measles vaccination was introduced throughout Jamaica in 1982. Routine childhood vaccination, conducted primarily through approximately 365 islandwide health centers, is required by law. The Pan American Health Organization's measles elimination strategy of routine vaccination supplemented by a 1-time-only "catch-up" vaccination campaign, along with subsequent periodic "follow-up" vaccination campaigns, was implemented in 1991.[5,7]

Surveillance provides information to monitor progress toward measles elimination. Since 1977, a national surveillance structure has been developed and implemented in Jamaica. Mandatory reporting of suspected measles cases started in 1991; before then, reporting was voluntary but occurred extensively. Measles surveillance is based on a clinical case definition of fever and generalized rash. Until 1991, confirmed measles cases were based on clinical grounds alone. Since September 1991, confirmed cases have involved serologic evidence of measles infection and/or epidemiologic contact with an individual having a laboratory-confirmed case. Initially, paired acute and convalescent sera were tested for IgG seroconversion. Since 1996,

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